EXECUTIVE SUMMARY

This report describes laboratory measurements to determine the extent and nature of interference to Public Safety radio receivers by ultrawideband (UWB) signals. Two Public Safety radio receivers from different manufacturers were tested in the 138-MHz band, both configured for Project 25 digital radio mode and one additionally configured and tested in analog mode. The laboratory measurements were performed by inserting increasing levels of UWB interference and measuring either bit-error rate (BER) for digital radios or signal-plus-noise-plus-distortion to noise-plus-distortion ratio (SINAD) for one of the same radios placed in analog mode.

When put through the passband of the receiver and analyzed in terms of the spectral and amplitude probability statistics, we see that all UWB signals, while initially impulsive, are altered by the passband transfer function to take on characteristics that lie along a continuum from impulsive, to Gaussian noise-like, to sinusoidal. By varying pulse repetition frequency (PRF), pulse spacing schemes, and gating, a variety of UWB signals were generated for these measurements. However, because of the relatively narrow bandwidths of the receiver passband (12.5 kHz), none of the interfering signals were considered impulsive after alteration by the receiver passband transfer function. To be impulsive would have required PRFs significantly less than 12.5 kHz.

Results showed that, when reported in terms of average UWB power in the receiver bandwidth, there is little difference in interference to Public Safety radios when comparing each of the generated UWB signal types. When expressed in terms of signal-to-interference power ratio, where interference power is defined as the power passed through the receiver passband, reference sensitivity (5% BER for digital radios and 12 dB SINAD for analog radios) occurs at approximately 10 dB, with a variation of 2 to 5 dB on either side, depending upon the receiver and signal type. However, there are subtle trends, with gated signals being slightly more invasive and signals with spectral lines being slightly less invasive than signals that are Gauusian noise-like when altered by the receiver passband transfer function. When the interference power is expressed in terms of anything other than the mean power in the receiver bandwidth (e.g., wider bandwidths or peak power), the receiver response can vary greatly depending upon the nature of the interfering signal.